INDEX

Acetabularia mediterranea, protein synthesis in, 195, 203 ACTH, 115, 116	Carbobenzoxylated polypeptide chains, trypsin digestion of, 108, 109 Carboxypeptidase, use of in protein
Activation of amino acids for protein	structure studies, 107
synthesis, 205, 206	Centromeres, 19, 21, 22, 33, 35
"Active centers," chemical nature of,	Chiasmata, 21, 23
208	Chromatography, ion exchange, 109,
Adrenocorticotropic hormone, active	110
degradation products of, 129	Chromosome, organization of, 59-61
Adrenocorticotropin, structure of, 115,	Chromosomes, 19, 21, 24, 26–28
116	Cis-trans test, 29, 30, 88, 89
Adrenocorticotropins, species differ-	applied to host range function, 177
ences in, 152	Cistron, 29, 30, 89, 93
Alkaline phosphatase, genetic de-	Code, "commaless," 63, 64
termination of, 182	"Codes," genetic, 62–65
Allelic genes, 16	Collagen, characteristics of in relation
Allometric change, 10	to hydroxyproline content, 215
Amino acid activation, 205, 207	species differences in, 215, 216
Amino acid analogues, incorporation	structure of, 214, 215
into proteins, 190	Configurational isomerism in proteins,
Amino acid sequences, repetition of in	186
proteins, 207–209	α-Corticotropin, porcine, structure of,
Amino acids, abbreviations for, 105	130
Aristogenesis, 6, 13	Cytochrome c, species differences in,
	Cytoplasmic heredity, 222
Bacteriophage, plaque morphology of,	Cytopiasinic neredity, 222
67–71	Denaturation, 127
r-mutants of, 68–71	Deoxyribonucleic acid, chemical struc-
Bacteriophage proteins, fractionation of, 179, 182, 183	ture of, 44–56
Bacteriophages, chemistry and enzy-	conservation of during cell replica-
mology of, 71	tion, 41, 57–60
life cycle and biosynthesis of, 81	in chromosomes, 39–41, 44
morphology of T group, 75-77, 180,	molecular dimensions of, 49–51, 78–81
181	synthesis of, 55, 56
Biochemical evolution, 213	X-ray diffraction analysis of, 49
Biosynthesis of proteins, 195	Deuterium exchange, 123–125
INDEX	225

225

Differentiation, of teeth, 10 Hemoglobins, 167-171 reptilian jaw, 13 abnormal, structural differences in, Di-isopropylfluorophosphate, 208 169-171 Dinitrophenylation, 106, 107 species differences in, 158, 160, 161 Heredity, cytoplasmic, 222 Diploid cells, 21 Heterozygote, 16 Disulfide bridges, location of in pro-Homozygote, 16 teins, 113, 114 Horses, evolution of, 10-12 Host range genetics in bacteriophage, Elan vital, 6, 13 Endoplasmic reticulum, 196, 197, 199 Hypertensins, species differences in, Entelechy, 6, 13 155, 157 Enzymatic digestion of polypeptide chains, 106-111, 113 Immunochemical comparisons of serum Ergastoplasm, 196 proteins, 162, 163 Evolution, rate of, 218 Independent assortment, law of, 18, 19 Insulin, active degradation product of. "Fingerprinting" technique for peptides, 144 structure of, 122 Insulins, species difference in, 154, 155 Gamete, 21 Law of independent assortment, 18, 19 Genes, 15, 16 Law of segregation, 16, 17 analogous, 142 Linkage, 22, 23 determinants of protein structure. Linkage groups, 23, 26 164 Linkage map, for histidine biosynthesis dominant, 16 in Salmonella, 221, 222 homologous, 142 of T4 bacteriophage, 90, 92 linked, 22, 23 Lozenge genes, 28, 29 molecular size of, 27, 28 Lysozyme, of bacteriophage, 73-75, recessive, 16 183, 212 substructure of, 67 specificity of, 74 Genetic codes, 62-65 Genetic fine structure, 173 Macroevolution, 7, 9, 10 Genetic maps, 24, 25, 26 Maps, genetic, in bacteriophage, 84, fine structure, 86, 88–95, 173 173-176 in bacteriophage, 84, 173-176 Megaevolution, 7, 9. Genetic recombination, 16 Meiosis, 19, 21, 22 Genetics of host range in bacteriostages in, 22 phage, 173 Melanotropins, species differences in. Genotype, 15 Growth hormones, species differences structures of, 153 in, 158 Membrane, cytoplasmic, 196-199 Gryphaea, evolution of, 7-10 Mendelian genetics, 16-19 Microevolution, 7 Haploid cells, 21 "Microheterogeneity," 187 α-Helical coiling in globular proteins, Mitosis, 19, 20 118, 119 stages in, 20 Helical coiling in proteins, 100, 101 Mutagenesis, chemical, 40 α-Helix, 100–102 Mutants, deletion, 86, 89, 91 dimensions of, 101 Mutation, 27

THE MOLECULAR BASIS OF EVOLUTION

Mutations, effects on protein structure, 166 Muton, 93 Myoglobin, structure of, 98 Natural selection, 11, 15 Neurospora, 31-38 nutritional mutants of, 31, 32, 34, 36, 37 Neurospora crassa, life cycle of, 32 Nucleus, composition of, 40 "One gene-one enzyme" hypothesis, 36 Opsins, species variations in, 216-218 Optical rotation of proteins, 118, 119 Ostrea, evolution of, 7 Oxidation of disulfide groups in proteins, 107, 108 Papain, active degradation products of, Paper chromatography, of amino acids, 150, 151 of peptides, 145, 146 Paper electrophoresis of peptides, 145, Peptide "fingerprints," 144 Peptide patterns as "fingerprints" of proteins, 144 Peptide separation on paper, 144-146 Phenotype, 15 Phosphoserine, in proteins, 208 Phylogenetic relationships, 3-6 Polypeptide chain, dimensions of, 100 Preadaptation, 13 Prolactins, species differences in, 158, 160 Protamines, conjugation of with DNA, 200, 201 Protein biosynthesis, 195 in Acetabularia mediterranea, 195, in ruptured-cell preparations, 205 Protein structure, configurational isomerism in, 186 sequential isomerism in, 186 species variation in, 142 Proteins, bacteriophage, fractionation of, 179, 182, 183 biological activity of, in relation to structure, 126

INDEX

Proteins, heterogeneity of, 185 Pseudoalleles, 28, 29 "Quantum evolution," 11 Radiation, adaptive, 10 mutational effect of, 28, 29 Recombination frequency, 23 Recombination units, 25 Recon, 30, 93 Replication, and structure of deoxyribonucleic acid, 55 "copy-choice," 86, 87 Reversible denaturation, of papain, 131 of ribonuclease, 136, 137 Ribonuclease, action of, 103, 104 composition of, 104, 105 partial reduction with retention of activity, 134, 135 pepsin digestion of, 133, 135, 137, peptide "fingerprint" of, 144, 146, 148-151 photooxidation of, 132, 133 reduction of, 133-135 reversible denaturation of, 136, 137 structure-function relationships, 131 structure of, 112, 115 subtilisin digestion of, 132, 135, 137-140 synthetic substrate for, 104 Ribonucleases, beef and sheep, compositions of, 147 species differences in structures of, Ribonucleic acid, chemical structure of, 45, 46 nuclear, turnover of, 201, 202 role in protein synthesis, 203, 204, Salmonella, chemical genetics of, 221, Saltation, 7 Secondary structure, 117 "Segregation, law of," 16, 17 Sequential isomerism in proteins, 186 Serum albumin, absence from sera of certain individuals, 220 Serum proteins, species differences in,

161-163

227

Species variation in protein structure, 142
Spectroscopic properties of proteins,119
Structure, of proteins, 99
in relation to function, 126
primary, 99
secondary, 99-102
tertiary, 99, 102

Teeth, differentiation of, 10 Tertiary structure, 117 Three-factor cross, 175 Transduction, 95 Transformation, by DNA, 41-44
of linked genes, 44
Tyrosine, anomolous light absorption
of, in proteins, 119, 120
-carboxylate interactions, 120, 121

Urea, effect of on protein structure, 120, 124

Visual pigments, species differences in, 216-218

Zygote, 21, 32, 33, 35